

These figures indicate a Gambel's Sparrow population at the Sault of over seven per cent of the numbers of White-crowned Sparrows. In Berrien County in May, 1918, two of the three "White-crowned Sparrows" collected by N. A. Wood were *gambeli*. On the other hand sixteen skins from Washtenaw, Huron, and Tuseola Counties in southeastern Michigan in the University of Michigan Museum of Zoology are all *leucophrys* as were 220 trapped and banded by the Wing brothers at Jackson since 1925.

Now that it is known that the Gambel's Sparrow is to be expected in Michigan it will be interesting to see whether that knowledge will greatly increase the number of occurrences reported during the next few years.

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THE SEQUENCE OF THE MOLT

BY LYNDS JONES

Dr. Witmer Stone's paper entitled "The Molting of Birds, with Special Reference to the Plumages of the Smaller Land Birds of Eastern North America", published in the January issue of the *Proceedings of the Academy of Natural Sciences of Philadelphia* (1896, pages 108-167), is largely based upon museum specimens. It contains no detailed description of the sequence of molt in any species, and as the title implies, is primarily concerned with the sequence of plumages rather than with the molt proper.

Dr. Jonathan Dwight's paper entitled "The Sequence of Plumages and Molt of the Passerine Birds of New York", published in the *Annals of New York Academy of Sciences* (Vol. 13, 1900, pages 73-360), gives a generalized account of the sequence of the molt, but also is primarily concerned with the sequence of plumages.

It is my purpose, in this paper, to give in detail the sequence of the molt in the adult Bobolink as a typical representative of the Passerine birds in particular, and as a point of departure for making comparisons of the molt in other groups. The material that I have had to work on includes Gray Ruffed Grouse, Killdeer, Mourning Dove, Kingbird, Crested Flycatcher, Bobolink, Cowbird, Meadowlark, Bronzed Grackle, Vesper Sparrow, Song Sparrow, Towhee, Bank Swallow, and Catbird, all specimens in the flesh. In the cases of the Bobolink, Cowbird, and Bronzed Grackle many specimens representing all stages of the molt have been handled, and with the Cowbird and

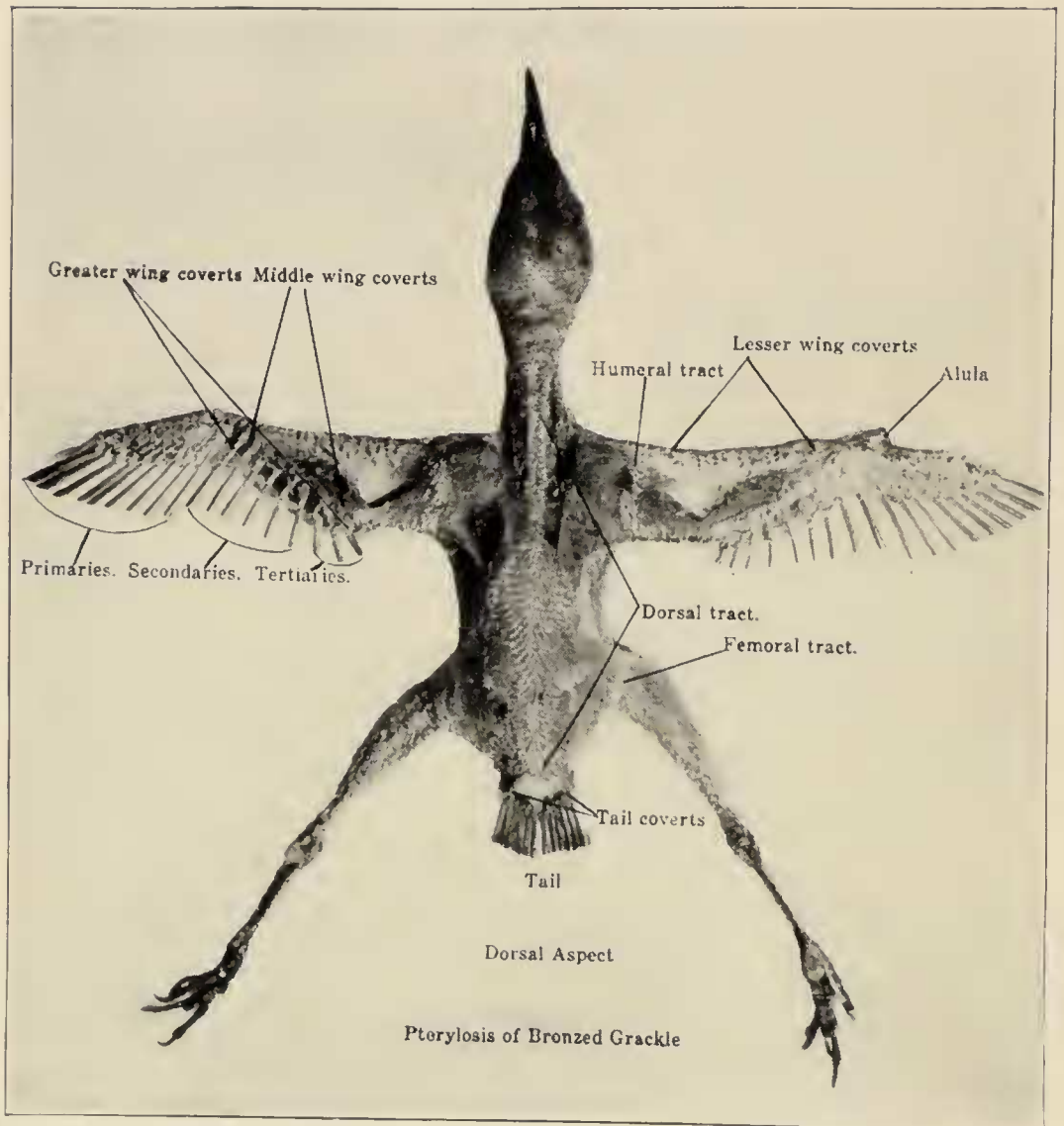


FIG. 3. Dorsal aspect of the Bronzed Grackle, showing pterylae.

Bronzed Grackle the college campus roost of these birds has furnished much valuable material.

Dr. Stone suggested that there is probably some individual variation in the order of the molt within the species, and in the handling of the abundant material in the three species of Icteridae I found this to be true, but only in exceptional cases, where the specimen was clearly abnormal in other respects, was this variation marked, so that it is possible to state that a certain order of molt is the normal one for a given species. It is this normal molt in the case of the Bobolink (*Dolichonyx orizivorus*) that I wish to give here.

Feathers from the various tracts which are lost at the same time are "grouped".

Group 1. Tenth primary and covert, central row of dorsal tract, central row of humeral tract, extreme forehead, outermost greater wing covert, innermost middle wing covert, a row on each side of the central row of the pectoral tract, the anterior row of the femoral tract. The 9th and 8th primaries drop so soon after the 10th that the other tracts merely lose more feathers so that the areas being molted spread. When the 7th primary is shed the lowermost and outermost lesser wing covert is shed, with a considerable spread of the dorsal tract laterally, at least three rows of the humeral tract, the forehead to near the crown, the pectoral tract has widened and extended forward to the throat and backward to include the abdominal tract.

Group 2. Sixth primary, all of the greater and middle wing coverts, the middle pair of tail feathers, the outermost upper and under tail coverts, under wing coverts, top of head, and the throat, with still more spreading of the other tracts before mentioned. With the fall of the 5th primary there is merely more spreading of the general molt.

Group 3. Fourth primary, outer secondary, 2d tertiary.

Group 4. Third primary, 2d secondary, 1st and 3d tertiaries.

Group 5. Second primary, 4th secondary, bastard wing.

Group 6. First primary, 5th and 6th secondaries, nape, and completion of molt of all other tracts, except scattered feathers in the general body plumage.

As both Dr. Stone and Dr. Dwight have pointed out, the order of molt is such that no part of the bird's body is left bare at any time, except that the forehead may be bare for a day or two. And at no time is the bird rendered flightless, or even tailless. But the tail feathers are shed in pairs rapidly and its upper and under coverts

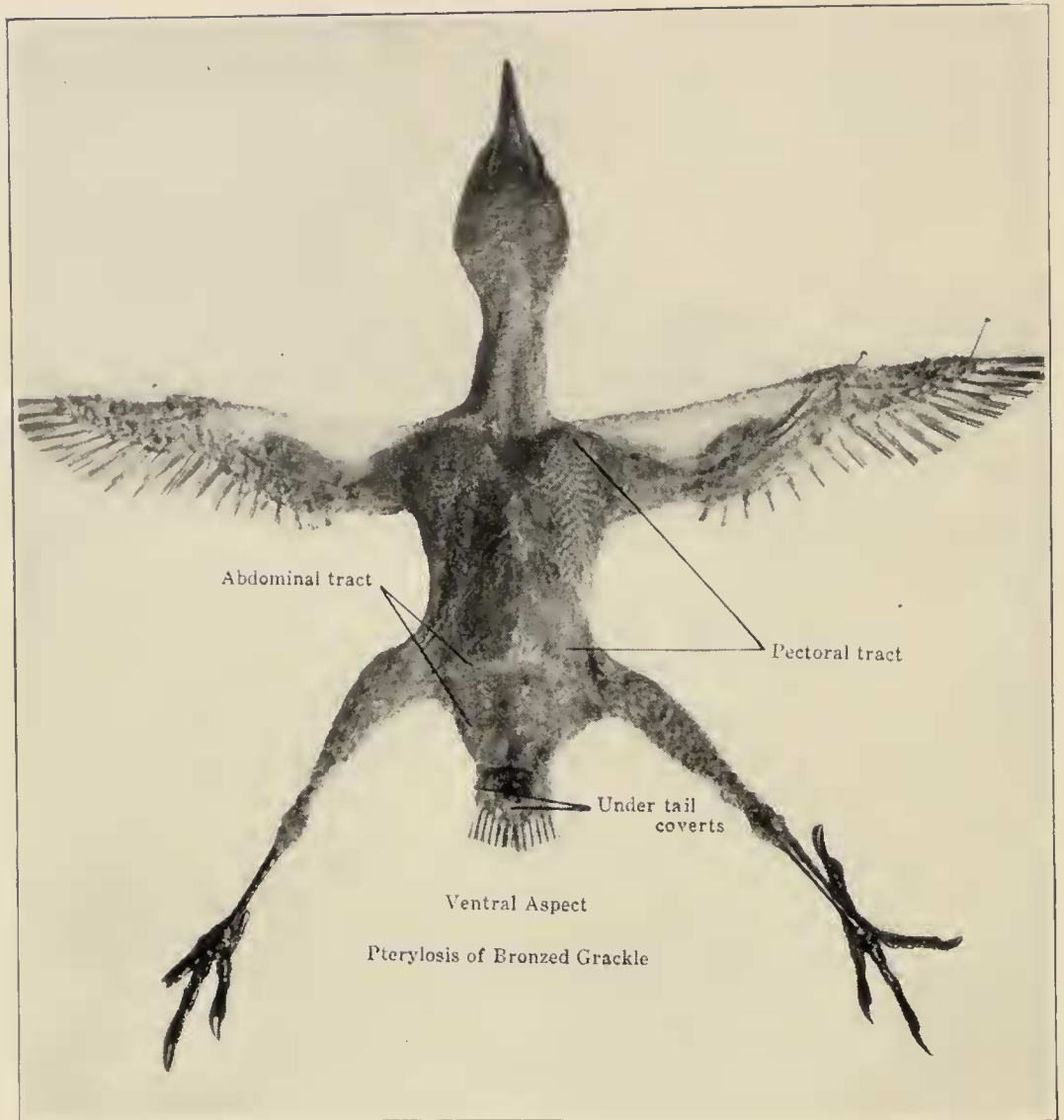


FIG. 4. Ventral aspect of the Bronzed Grackle, showing pterylosis.

are shed as rapidly, so that for a short time the bird shows a stubby tail.

In working out the order of molt in the primaries I have given the innermost as number 10 for convenience. Of course some species have only nine; in which case the molt of the outermost, which would properly be called number 1, but in my annotation would be 2, marks the completion of the molt, except for the scattered body feathers mentioned. They seem to persist after the regular molt, possibly as an added protection to the body.

I have made use of groups of feathers involved in the several stages of the molt because there is some variation in the exact order of feather loss. Thus it is usual for the molt to begin in the middle of the expanded dorsal tract and from that center spread forward and backward in this tract, and for the 10th primary to drop out after this spreading has begun. The primaries and secondaries seem to be held in their sockets more firmly than are the body feathers, and therefore might often cling after they had been pushed partly out by the new feather.

I have no data on the length of time that it takes a bird to shed its plumage and get a new one. Banding might settle this point. But in any case birds banded during July and August ought to be examined for evidence of molt and the results recorded carefully.

It is assumed that the old feathers are pushed out of the follicle in which they grew as a necessary consequence of the growth of the new feather in the same follicle. Of course this is true, but I have good evidence that many of the old feathers are pulled out by the bird. In fact, I have seen them do it. Under the campus roost of the Bronzed Grackles and Cowbirds, an account of which occupies the whole of WILSON BULLETIN No. 15, feathers that were shed during the night littered the ground. I gathered the larger feathers every morning. I have a complete series of the primaries and tail feathers. Many of these feathers have a broken place on one of the vanes. I was unable to account for this until I saw a flock of Cowbirds that was waiting for an opportunity to steal into the roost, busily engaged in pulling feathers out of their plumage. When I gathered these feathers they had the telltale broken places in one vane. An individual that happened to be within ten feet of me was digging away at his wing, and when I saw him pluck the feather out and drop it I went at once and picked it up. It had the broken place in the vane. Of course I am not claiming that all the feathers are plucked out. Probably few of them are.

In the other Passerine birds the molt of which I have studied there is a close conformity to the method that I have given for the Bobolink. In most of the species there is no molt of the flight feathers in the young of the year. Just which species do molt all of the plumage is a topic for study.

I was surprised to find that while the Gray Ruffed Grouse shed its feathers rapidly the order of shedding was much the same as that of the Passerine birds. Likewise, the Mourning Dove had much the same order of molt, but its progress was so slow that a new feather was fully half grown before the one next to it was shed. The Killdeer did not show material differences in the order of molt.

It is well known that some ducks and gallinaceous birds shed their feathers so rapidly that they are practically naked and unable to fly for some days. The woodpeckers shed the middle pair of tail feathers last, and the Kingfisher has his own method.

As I have suggested above, study of the molting of birds can and ought to be a regular part of the bird bander's privilege. Many birds have partial molts at various times in the year. It would be well if every bird banded were examined for the purpose of determining whether or not it showed evidences of molt.

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BREEDING OF THE LEAST TERN IN IOWA

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The Least Tern (*Sterna antillarum*) has been observed in the Sioux City region quite regularly by various persons during the summer months in recent years—perhaps for the last twenty years, at least. It usually appears during the last week of May, and remains often throughout August. There has been some local discussion from time to time as to the probability of the birds breeding here.

In 1885 Agersborg (*Auk*, II, page 289), writing on "The Birds of Southeastern South Dakota", and dealing with Clay, Yankton, and Union Counties, says of the Least Tern, "Summer resident; breeds".

W. W. Cooke, in 1888 ("Bird Migration in the Mississippi Valley", page 58), perhaps with the preceding report in mind, makes the following statement concerning this bird: "Chiefly coastwise, but passes up the Mississippi Valley to Dakota and Minnesota. Breeds abundantly along the Gulf coast in Louisiana and Texas; also in the interior; known to breed in Kansas and Dakota".